WHAT IS CLAIMED IS:

1. An optical device comprising a diamondoid-containing material.

2. The optical device of claim 1, wherein the diamondoid-containing material comprises at least one higher diamondoid.

3. The optical device of claim 1, wherein the at least one higher diamondoid is a derivatized higher diamondoid.

4. A solid state dye laser comprising a diamondoid-containing lasing medium, an optical pumping system for delivering energy to the lasing medium, and an optical resonator for processing the light emitted from the lasing medium.

5. The solid state dye laser of claim 4, wherein the lasing medium comprises a diamondoid-containing host material and at least one color center within the host material.

6. The solid state dye laser of claim 5, wherein the color center comprises at least one nitrogen heteroatom in a heterodiamondoid, the heterodiamondoid positioned adjacent to at least one vacancy or pore.

7. The solid state dye laser of claim 5, wherein the diamondoid-containing host material is selected from the group consisting of a CVD-deposited film, a molecular crystal, and a polymerized material.

8. The solid state dye laser of claim 5, wherein the host material comprises at least one diamondoid selected from the group consisting of adamantane, diamantane, and triamantane, and heterodiamondoid derivatives thereof.

9. The solid state dye laser of claim 5, wherein the host material comprises at least one diamondoid selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane, and heterodiamondoid derivatives thereof.

10. The solid state dye laser of claim 4, wherein the lasing medium comprises a diamondoid-containing host material and an optically active dopant.

11. The solid state dye laser of claim 10, wherein the optically active dopant is selected from the group consisting of titanium, vanadium, chromium, iron, cobalt, nickel, zinc, zirconium, niobium, cadmium, hafnium, tantalum, tungsten, rhenium, osmium, iridium, platinum, gold, mercury, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, uranium, and mixtures thereof.

12. The solid state dye laser of claim 10, wherein the diamondoid-containing host material is selected from the group consisting of a CVD-deposited film, a molecular crystal, and a polymerized material.

13. The solid state dye laser of claim 10, wherein the host material comprises at least one diamondoid selected from the group consisting of adamantane, diamantane, and triamantane, and heterodiamondoid derivatives thereof.

14. The solid state dye laser of claim 10, wherein the host material comprises at least one diamondoid selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane and heterodiamondoid derivatives thereof.

15. A semiconducting laser having a light emitting *p-n* junction comprising a *p*-type diamondoid-containing material positioned adjacent to an *n*-type material to form a *p-n* junction for light emission.

16. The semiconducting laser of claim 15, further including a means to apply a foward bias across the *p-n* junction to cause the emission of laser light from the *p-n* junction.

17. A semiconducting laser having a light emitting *p-n* junction comprising a *n*-type diamondoid-containing material positioned adjacent to an *p*-type material to form a *p-n* junction for light emission.

18. The semiconducting laser of claim 17, further including a means to foward bias the *p-n* junction to cause the emission of laser light from the *p-n* junction.

19. The semiconducting laser of claim 15, wherein the *p*-type diamondoid-containing material is selected from the group consisting of a CVD-deposited film, a molecular crystal, and a polymerized material.

20. The semiconducting laser of claim 19, wherein the polymerized material is conductive, or comprises a conducting polymeric material.

21. The semiconducting laser of claim 17, wherein the *n*-type diamondoid-containing material is selected from the group consisting of a CVD-deposited film, a molecular crystal, and a polymerized material.

22. The semiconducting laser of claim 21, wherein the polymerized material is conductive, or comprises a conducting polymeric material.

23. The semiconducting laser of claim 15, wherein the *p*-type diamondoid-containing material comprises at least one diamondoid selected from the group consisting of adamantane, diamantane, and triamantane, and heterodiamondoid derivatives thereof.

24. The semiconducting laser of claim 15, wherein the *p*-type diamondoid-containing material comprises at least one diamondoid selected from the group consisting of

tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane, and heterodiamondoid derivatives thereof.

25. The semiconducting laser of claim 17, wherein the *n*-type diamondoid-containing material comprises at least one diamondoid selected from the group consisting of adamantane, diamantane, and triamantane, and heterodiamondoid derivatives thereof.

26. The semiconducting laser of claim 17, wherein the *n*-type diamondoid-containing material comprises at least one diamondoid selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane, and heterodiamondoid derivatives thereof.

27. A light emitting diode comprising a diamondoid-containing material having a bandgap, and a means for generating an electric field to cause at least one electronic transition such that light is emitted from the diode.

28. The light emitting diode of claim 27, wherein the electronic transition occurs across the bandgap.

29. The light emitting diode of claim 28, further configured such that the electronic transition occurs without participation of electronic states within the bandgap.

30. The light emitting diode of claim 28, wherein the bandgap of the diamondoid-containing material is at least 3 eV.

31. The light emitting diode of claim 28, wherein the bandgap of the diamondoid-containing material is at least 4 eV.

32. The light emitting diode of claim 28, wherein the bandgap of the diamondoid-containing material is at least 5 eV.

33. The light emitting diode of claim 27, wherein the wavelength of the emitted light is in the ultraviolet range of the electromagnetic spectrum.

34. The light emitting diode of claim 27, wherein the diamondoid-containing material is selected from the group consisting of a CVD-deposited film, a molecular crystal, and a polymerized material.

35. The light emitting diode of claim 27, wherein the diamondoid-containing material comprises at least one diamondoid selected from the group consisting of adamantane, diamantane, and triamantane, and heterodiamondid derivatives thereof.

36. The light emitting diode of claim 27, wherein the diamondoid-containing material comprises at least one diamondoid selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane, and heterodiamondid derivatives thereof.

37. A photodetector comprising a diamondoid-containing material having a bandgap, and a means of processing current from at least one electronic transition that results from the absorption of light by the material.

38. The photodetector of claim 37, wherein the electronic transition occurs across the bandgap.

39. The photodetector of claim 38, further configured such that the electronic transition occurs without participation of electronic states within the bandgap.

40. The photodetector of claim 38, wherein the bandgap of the diamondoid-containing material is at least 3 eV.

41. The photodetector of claim 38, wherein the bandgap of the diamondoid-containing material is at least 4 eV.

42. The photodetector of claim 38, wherein the bandgap of the diamondoid-containing material is at least 5 eV.

43. The photodetector of claim 37, wherein the wavelength of the detected light is in the ultraviolet range of the electromagnetic spectrum.

44. The photodetector of claim 37, wherein the diamondoid-containing material is selected from the group consisting of a CVD-deposited film, a molecular crystal, and a polymerized material.

45. The photodetector of claim 37, wherein the diamondoid-containing material comprises at least one diamondoid selected from the group consisting of adamantane, diamantane, and triamantane, and heterodiamondoid derivatives thereof.

46. The photodetector of claim 37, wherein the diamondoid-containing material comprises at least one diamondoid selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane, and heterodiamondoid derivatives thereof.

47. The optical device of claim 1, wherein the optical device is selected from the group consisting of a photoresistor, a phototransistor, a photovoltaic cell, and a solar cell.

48. The optical device of claim 47, wherein the diamondoid-containing material is selected from the group consisting of a CVD-deposited film, a molecular crystal, and a polymerized material.

49. The optical device of claim 47, wherein the diamondoid-containing material comprises at least one diamondoid selected from the group consisting of adamantane, diamantane, and triamantane, and heterodiamondoid derivatives thereof.

50. The optical device of claim 47, wherein the diamondoid-containing material comprises at least one diamondoid selected from the group consisting of tetramantane,

pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane, and heterodiamondoid derivatives thereof.

51. An anti-reflection coating comprising at least one alternating pair of a high refractive index diamondoid-containing layer and a low refractive index layer.

52. The anti-reflection coating of claim 51, wherein the coating comprises at least four alternating pairs of a high refractive index diamondoid-containing layer and a low refractive index layer.

53. The anti-reflection coating of claim 51, wherein the coating comprises at least six alternating pairs of a high refractive index diamondoid-containing layer and a low refractive index layer.

54. The anti-reflection coating of claim 54, wherein the refractive index of the diamondoid-containing material is at least 1.6.

55. The anti-reflection coating of claim 54, wherein the refractive index of the high refractive index diamondoid-containing layer is at least 1.8.

56. The anti-reflection coating of claim 54, wherein the refractive index of the high refractive index diamondoid-containing layer is at least 2.0.

57. The anti-reflection coating of claim 54, wherein the refractive index of the high refractive index diamondoid-containing layer is at least 2.2.

58. The optical device of claim 1,wherein the optical device is selected from the group consisting of a lens, a mirror, a pressure window, and an optical waveguide.

59. The optical device of claim 58, wherein the diamondoid-containing material is selected from the group consisting of a CVD-deposited film, a molecular crystal, and a polymerized material.

60. The optical device of claim 59,wherein the diamondoid-containing material comprises at least one diamondoid selected from the group consisting of adamantane, diamantane, and triamantane, and heterodiamondoid derivatives therof.

61. The optical device of claim 60,wherein the diamondoid-containing material comprises at least one diamondoid selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane, and heterodiamondoid derivatives thereof.

62. A method of generating laser light from a solid state dye laser, wherein the method comprises:

a) providing a lasing medium that comprises a diamondoid-containing host material and at least one color center within the host material; and

b) subjecting the lasing medium to energetic stimulation sufficient to cause lasing.

63. A method of generating laser light from a solid state dye laser, wherein the method comprises:

a) providing a lasing medium that comprises a diamondoid-containing host material and at least one optically active dopant within the host material; and

b) subjecting the lasing medium to energetic stimulation sufficient to cause lasing.

64. A method of generating laser light from a semiconductor laser, wherein the method comprises:

a) positioning a *p*-type diamondoid containing material adjacent to an *n*-type material to form a *p-n* junction; and

b) applying a foward bias to the *p-n* junction, the foward bias sufficient to cause lasing.

65. A method of generating laser light from a semiconductor laser, wherein the method comprises:

a) positioning an *n*-type diamondoid containing material adjacent to an *p*-type material to form a *p-n* junction; and

b) applying a foward bias to the *p-n* junction, the foward bias sufficient to cause lasing.

66. A method of generating light from a light emitting diode, wherein the method comprises:

a) providing a diamondoid-containing material having a bandgap; and

b) applying an electric field across the diamondoid-containing material to cause an electronic transition to occur across the bandgap of the material, thereby generating laser light.

67. The method of claim 66, further including the step of emitting light in the ultraviolet range of the electromagnetic spectrum.

68. A method of detecting light with a photodetector, the method comprising:

a) providing a diamondoid-containing material having a bandgap; and

b) absorbing light by the diamondoid-containing material to cause an electronic transition to occur across the bandgap, thereby generating laser light.

69. The method of claim 68, further including the step of detecting light in the ultraviolet range of the electromagnetic spectrum.

70. A method of reducing the amount of light reflected from a surface, the method comprising:

a) providing an anti-reflection coating on the surface, the anti-reflection coating comprising at least one alternating pair of a high refractive index diamondoid-containing layer and a low refractive index layer; and

b) exposing the anti-reflection coating to light.